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(54) Title: AGGLOMERATION OF FINE PARTICULATE MATERIAL

(57) Abstract: A method of pelletising fine particulate material comprising delivering the material onto a perforated or apertured surface to enable the material to flow through the perforations wherein the perforations are predominantly of a size which is significantly greater than the diameter of the fine particulate material and permitting the material to flow from the surface through the perforations.

"Agglomeration of Fine Particulate Material"

Field of the Invention

This invention relates to the agglomeration of fine particulate material to produce sized pellets. More particularly, this invention relates to the agglomeration of fine-powders to produce pellets of relatively uniform size and/or hardness.

Background

Many fields of industrial activity involve or require the handling, use or processing of fine particulate materials which are generally of a dimension of less than 0.1mm. Such fine particulate materials are often referred to as "fines" and can be the undesirable result of a processing activity such as, for example, mining where the extraction and handling of mineral ores may result in the generation of fines which are unsuitable for use in the extraction process because of their very small size. Typically, such fines are required to be either pelletised in order that they can subsequently be utilised in the extraction process or discarded altogether. In certain other fields of activity, such as for example the chemical, pharmaceutical and mineral processing fields, it is often desirable or necessary for a certain processing step to require fine particulate materials. However significant difficulties may arise in regard to the handling, storage, transportation and processing of those fine particulate materials prior to their final application.

Accordingly, it is often desirable to be able to convert certain fine particulate materials into larger pellets or granules to facilitate their further processing (as in the case of various mineral ores) and/or to facilitate the handling, storage and transportation of the materials. Such pellets or granules are in many cases required to be spherical in shape and as uniform as possible in composition and density for ease of handling and to enhance the quality of end products formed therefrom. Furthermore, and particularly in the case of materials which are utilised because of their fine particulate nature, it is almost always necessary that such pellets or granules are easily returned or dispersible back to their fine

particulate state. Hence, steps may need to be taken to be able to accommodate for the intractable nature of a particular material in the handling of the material.

Some of the difficulties that arise in relation to the treatment and handling of fine particulate materials relate to the ease with which the materials can become airborne and thus present a danger to personnel in the vicinity of or involved in the handling of such materials. As well as the hazardous nature of such airborne fine particulate materials, such a tendency may also give rise to significant difficulties in the processing and handling of such materials. Such difficulties may include a substantial increase in any corresponding plant maintenance efforts, as well as a certain lack of control over the processing system due to irregular material flow.

A further significant difficulty which is often encountered with fine particulate materials relates to the storage, transportation and handling of such materials and the problems that may arise therewith due to the inherent resistance of the material to behave in a fluid-like manner. That is, in the case of many such materials, once they are reduced to a particulate size of the order of less than 0.1 of a millimetre, they may become "sticky" in nature and as a result, will typically not flow freely and tend to clump. This tendency to compact or clump and the sticky nature of the fine particulate material may lead to the material "hanging-up" on the inside walls of a distribution, storage or transportation container and may hence complicate the process of feeding the material to a subsequent stage or point for further application. This "stickiness" is thought to be a result of cohesive forces that are inherently present in the particles but which become enhanced when the particles are of a reduced size, generally of the order of microns or less, which increases the relative magnitude of the cohesive forces. It is believed that such cohesive forces can comprise one or more of van de Waals' forces, gravitational forces, electrostatic forces or the like. Typically, the magnitude of the cohesive forces may vary depending upon the inherent nature of the material as well as any adverse static charge that may be induced by virtue of the complexity of the overall processing system adopted.

In the past there have been a variety of methods which have been utilised for the pelletising of or formation of granules from fine particulate material. Such

methods have included a variety of compaction processes which typically result in the production of compacted pellets. Such compaction processes generally involve the use of a binding agent and in some instances involve the use of a moulding process in order to form briquettes or tablets. Certain compaction-based processes may however work against the original purpose for which the fine powders were produced due to the loss of overall surface area of the fine powder material. That is, the resulting compacted material may not be able to be reduced back down to its original state for subsequent processing without being subjected to some further reducing step.

Other methods of agglomeration have involved causing a particulate material to be tumbled or mixed. In many cases such tumbling or mixing is effected in association with utilisation of a binder and/or the application of heat. Other forms of agglomeration have comprised spray-drying processes whereby a slurry is formed from the combination of a fine particulate material together with a suitable binder or other agglomerating liquid. The slurry is then typically sprayed in a droplet or globular form in order to drive off the carrier liquid which results in the globules being transformed into dry granules or pellets. Such processes may however result in the part-destruction of the material and a certain degree of unwanted case-hardening thereof.

A particular problem associated with many known agglomeration processes, including those which have been referred to above, has been the difficulty of economically obtaining pellets which are of a consistent or uniform size and/or substantially consistent or uniform density.

Still further, and in addition to the above methods, other methods of agglomeration are disclosed in US 5124100, WO98/06513, WO95/09616 and WO95/09615.

The preceding discussion of the background to the invention is intended only to facilitate an understanding of the present invention. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material

referred to was part of the common general knowledge in Australia or elsewhere as at the priority date of the application.

Disclosure of the Invention

Throughout the specification, the term fine particulate material shall be taken as comprising material having a particulate size having a diameter of less than 0.1 millimetres and which has or acquires cohesive forces which tend to cause the particulate material to clump or adhere to itself which can influence the fluidity of the particles thereof.

The invention stems from a discovery that causing fine particulate material to flow through a perforated surface having apertures of a diameter significantly greater than the diameter of the particles results in the particles agglomerating during their passage through the apertures to form agglomerated pellets or granules which pass from the apertures.

Accordingly, the invention resides in a method of pelletising fine particulate material comprising delivering the material onto a perforated surface to enable the material to flow through the perforations wherein the perforations are predominantly of a size which is significantly greater than the diameter of the fine particulate material and permitting the material to flow from the surface through the perforations.

According to a preferred feature of the invention, the perforations or apertures within the surface are all of substantially the same size, said size being greater than the diameter of the largest particles within the fine particulate material. According to a preferred feature of the invention, the fine particulate material typically comprises or is produced with individual particles which are essentially similar in size, and depending upon the particular material to be processed, the size of the perforations or apertures may be selected to be within a factor of 10 to 20 times that of the diameter of a particle of average size.

According to a preferred feature of the invention, the material is agitated on the perforated surface. According to a preferred feature, the agitation is effected by causing the surface to vibrate. According to an embodiment, the principal direction of vibration is substantially parallel to the surface. According to an alternative embodiment, the principal direction of vibration is substantially perpendicular to the surface. According to an alternative embodiment thedirection of movement is both substantially parallel to the surface and substantially perpendicular to the surface. According to a variation of each of the previous described embodiments the vibratory motion of the surface is cyclical.

According to a preferred feature of the invention, the perforated surface comprises a mesh or screen.

According to a preferred feature of the invention, the mode of agitation selected for the screen contributes to the formation of pellets of a particular shape. According to one embodiment, pellets substantially spherical in shape may be produced by a screen with a cyclical vibratory motion. According to a further embodiment, pellets of a substantially 'rice grain' shape may be produced by a screen with a vibratory motion in one direction only.

According to a preferred feature of the invention, the size of the perforations or apertures in the screen determines the maximum size possible for the pellets formed.

According to a further preferred feature of the invention, the material is subjected to a screening action prior to delivery to the surface or screen.

According to a further preferred feature of the invention, the material is subjected to agitation prior to delivery to the surface or screen.

According to a preferred feature of the invention, the material is caused to be passed along a flow path and the agitation comprises causing the material to vibrate as it traverses the flow path. According to one embodiment, the flow path comprises an inclined chute which is caused to vibrate.

According to a preferred feature of the invention, the pre-treatment effected by the screening action and/or the agitation prior to delivery onto the surface or screen serves to essentially homogenise the fine particulate material such that neither overly compacted or loose pockets of material exist. In this way, the material delivered onto the surface or screen is substantially of a similar consistency, this facilitating the subsequent production of pellets of a relatively uniform hardness and density in an optimal manner.

According to a further preferred feature of the invention, the pelletised material flowing from the apertures is screened to separate non-pelletised or partially-pelletised material.

According to a further preferred feature of the invention, the material is able to be treated in its dry, raw state by way of the above described method. That is, a process of dry agglomeration of the fine particulate material can be effected by application of the above described method.

According to a further preferred feature of the invention, the material is treated prior to delivery to the surface to increase its inherent cohesive characteristics. According to one embodiment, the treatment comprises the application of a binding material to the particulate material. According to another embodiment, the treatment comprises electrostatically treating the material to cause it to become electrostatically charged. According to a further embodiment, the treatment comprises heating the material. According to a further embodiment, the treatment comprises cooling the material.

According to a further preferred feature of the invention, the material may be subjected to a reduction action once it has been delivered onto the perforated surface. Such an action may be effected in order to promote the reduction of any clumped masses of particles into smaller agglomerates which may then be more readily processed by the perforated surface or screen. According to one embodiment, a mechanical wiper means may be operatively arranged with respect to the perforated surface such that the material delivered there onto may be broken down into smaller agglomerates for subsequent passage through the

perforations. The wiper means may also be arranged to physically promote the passage of the fine particulate material through the perforations such that pelletization may occur.

According to a further embodiment, one or more rolling elements may be provided on top of the perforated surface to effect the reduction action. Such rolling elements may conveniently take the form of hard spherical balls which, by virtue of the agitation of the screen, are caused to randomly move about on top of the screen and in doing so break down any clumped masses of particles into smaller agglomerates. According to a further embodiment, zircon balls of a suitable size may be provided on top of the perforated screen for effecting the above-mentioned reduction of any clumped masses of particles.

According to a further preferred feature of the invention, the delivery of the fine particulate material onto the perforated screen and the formation of pellets may be effected in a continuous process.

According to a further preferred feature of the invention, residual fine particulate material which is mixed with the pellets produced by the method as previously described is separated from said pellets and thereafter delivered to the perforated or apertured surface. According to a preferred embodiment, the residual fine particulate material is delivered to the perforated or apertured surface directly. According to a preferred embodiment, the residual fine particulate material is delivered to the perforated or apertured surface after preliminary processing with additional fine particulate material.

According to a further aspect of the invention, there is provided an apparatus for the conditioning of feed material and the creation of pellets, the apparatus comprising a mixing means, a plurality of sieving means and processing hoppers which act, in use, to promote the preparation of feed material and the intimate contact of dry particles and to separate pellets so formed from other particles.

The invention will be more fully understood in the light of the following description of several specific examples of the application of the method according to the present invention.

Examples of the Invention

The following description of the examples is provided for the purposes of exemplification only and is not to be taken as limiting of the scope of the present invention.

Example 1

The fine particulate material comprised a titanium dioxide powder wherein each of the particles thereof had an assumed size of less than 1 micron and was on average of the order of 20 nanometres. Initially the powder material was deposited into a hopper having an outlet having a diameter of approximately 25 mm. A screen having a mesh or aperture dimension of approximately 2 mm was arranged within the hopper upstream of and proximate the hopper outlet. The outlet of the hopper opened onto a SYNTRON vibratory feeder which comprised an elongate trough which was caused to vibrate whereby the amplitude and/or the frequency of vibration could be adjusted. The trough was inclined downwardly from the hopper outlet. The lower end of the chute was located substantially centrally above a round vibratory screen and the height of the discharge end of the chute above the screen was of the order of 200 mm. The aperture size of the vibratory screen was 0.5 mm and the diameter of the screen was 350 mm.

The titanium dioxide powder, which does not flow well and which, due to the very fine particle size of the individual elements thereof, has a strong tendency to compact and form clumped masses of particles, was introduced into the hopper and was intermittently agitated in order to cause it to flow through the screen and onto the trough of the feeder. As well as separating any large unwanted impurities or foreign materials from the fine powder, the screen within the hopper also served to effect some pre-treatment of the material by forcing it to break down into smaller agglomerated clumps prior to being delivered onto the feeder.

As a result of the vibration induced unto the material by the vibrating trough, the titanium dioxide powder flowed readily along the trough and was deposited onto the screen. The vibratory action of the trough also served to effect some initial reduction of any clumped masses of particles which were delivered there onto from the hopper. It was also noted that, depending on the amplitude and/or frequency of vibration of the chute, the feeder could be made to promote a certain degree of pre-pelletization of the fine powder prior to the material being delivered onto the perforated screen.

The vibratory screen included a variable speed drive and for the purposes of processing the titanium dioxide powder the vibratory screen was driven at approximately 42.5 Hz. It was however noted that speeds within the range of 30 to 60 Hz were also likely to be able to cause some degree of agglomeration of the fine powder. With the fine powder on top of the screen, the vibratory action thereof caused pellets or granules of up to 2 mm in diameter to be formed on the top of the screen. These pellets tended to circulate around the perimeter of the screen until passing out through a discharge chute adjacent the upper face of the screen.

The material or powder which flowed or passed through the apertures in the screen appeared out the other side of the screen as pellets which were of a generally uniform density and size of the order of 0.2 mm. In addition, the pellets were of a generally spherical configuration and had significant hardness to enable the pellets to withstand handling without reverting to a powdery state.

Example 2

The same apparatus which was used in relation to Example 1 was utilised in processing fine alumina powder which also does not flow well due to some inherent cohesive characteristics of the powder. In order to make the fine powder more susceptible to the subject agglomerating process, a small amount of a binder solution was mixed with the alumina powder prior to its introduction to the vibrating screen. For this material, and for the purposes of clearly demonstrating the effect of a binder on the fine particulate material, the particular binder applied

was a solution of sodium silicate (or waterglass). However, other suitable binders may also or alternatively be applicable. For instance, an equally or more suitable binder for use with alumina powder may be aluminium oxide (Al_2O_3) which is a non-contaminating material and provides a good material match for the calcination of alumina up to 700°C.

The resultant mixture was delivered directly onto the vibrating screen which in this instance was caused to vibrate at a frequency of approximately 48 Hz. As was the case with Example 1, as a result of the application of the material to the vibrating screen, the particulate material was caused to pass through the perforations of the screen with pellets of reasonably uniform density and size being formed. These pellets so formed were resistant to some handling.

In the case of both examples as described above, the pellets which were formed on the upper face or on top of the perforated surface and which were discharged therefrom were essentially uncontrolled with respect to size and hardness. In the case of both examples, the final pellets were formed as result of the compacting and sizing of the fine particulate material as it passed through the perforations in the screen. As such, the pellets which issued through the apertures in the vibrating screen had a generally spherical configuration and were of a substantially uniform size and density. In addition and in the case of both examples, some fine particulate material also passed through the apertures in an unagglomerated form. According to one arrangement used to perform the above examples, this residual fine particulate material which passed through the apertures in an unagglomerated form was subsequently separated from the pellets which issued through the apertures, and the residual fine particulate material was returned to the perforated screen to be further processed with additional fine particulate material. According to an alternative arrangement, the residual fine particulate material was returned to the hopper. By either of these arrangements, it is possible to ensure that only pelletised material need be removed from the processing system.

It was further noted, particularly in respect of Example 2 where the application of a binder was necessary, that some post-treatment or curing, such as for example

drying, of the final pellets may be desirable depending upon the particular subsequent application thereof. Such post-treatment may be desirable to avoid any possible break-up of the resulting pellets and/or to reduce or eliminate any unwanted moisture from the final product.

Whilst the abovementioned examples have related to the utilisation of the process in association with specific materials, it is believed that the invention also has application in processing other forms of fine powder material, particularly where the particles exhibit cohesive characteristics, for the purposes of forming that material into substantially uniformly-sized pellets which may be capable of subsequently being readily broken down to enable utilisation of the powder material in a conventional form.

Modifications and variations as would be known to a person skilled in the art are considered to be within the scope of the present invention. For example, whilst the process for treating the fine powders as described in Examples 1 and 2 required only a single perforated screen, alternative embodiments may make use of a plurality of layered screens arranged to progressively size, separate and/or condition the pellets formed by way of the present invention. In one alternative arrangement, a two-deck screen may be provided wherein the pellets formed upon passing through an upper screen may drop onto a lower screen where a certain degree of pellet conditioning may be effected. For example, further rounding or smoothing of the pellet may be effected by virtue of the vibratory action of the lower screen on the pellets. The lower screen may be also or alternatively be arranged to enhance the hardness of the pellets by virtue of the retention time of the pellets on the surface of this lower vibrating screen. Furthermore, the lower screen may also be arranged to separate the final conditioned pellets from any unagglomerated fine powder material which may fall through the upper screen together with the desired agglomerated pellets.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

The claims defining the invention are as follows:

1. A method of pelletising fine particulate material comprising delivering the material onto a perforated or apertured surface to enable the material to flow through the perforations wherein the perforations are predominantly of a size which is significantly greater than the diameter of the fine particulate material and permitting the material to flow from the surface through the perforations.

2. A method of pelletising fine particulate material as claimed at claim 1 wherein the perforations or apertures within the surface are all of substantially the same size, said size being greater than the diameter of the largest particles within the fine particulate material.

3. A method of pelletising fine particulate material as claimed at either of claims 1 or 2 wherein the fine particulate material typically comprises or is produced with individual particles which are essentially similar in size, and depending upon the particular material to be processed, the size of the perforations or apertures is selected to be within a factor of 10 to 20 times that of the diameter of a particle of average size.

4. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the material is subjected to a principal agitation on the perforated surface.

5. A method of pelletising fine particulate material as claimed at claim 4 wherein the principal agitation is effected by causing the surface to vibrate.

6. A method of pelletising fine particulate material as claimed at claim 5 wherein the principal direction of vibration is substantially parallel to the surface.

7. A method of pelletising fine particulate material as claimed at claim 5 wherein the principal direction of vibration is substantially perpendicular to the surface.

8. A method of pelletising fine particulate material as claimed at claim 5 wherein the direction of movement is both substantially parallel to the surface and substantially perpendicular to the surface.

9. A method of pelletising fine particulate material as claimed at any one of claims 5 to 8 wherein the vibratory motion of the surface is cyclical.

10. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the perforated or apertured surface comprises a mesh or screen.

11. A method of pelletising fine particulate material as claimed at claim 10 wherein the mode of principal agitation selected for the screen contributes to the formation of pellets of a particular shape.

12. A method of pelletising fine particulate material as claimed at claim 11 wherein pellets substantially spherical in shape are produced by a screen with a cyclical vibratory motion.

13. A method of pelletising fine particulate material as claimed at claim 11 wherein pellets of a substantially 'rice grain' shape are produced by a screen with a vibratory motion in one direction only.

14. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the size of the perforations or apertures in the screen determines the maximum size possible for the pellets formed.

15. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the material is subjected to pre-treatment by a screening action prior to delivery to the surface or screen.

16. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the material is subjected to pre-treatment by a preliminary agitation prior to delivery to the surface or screen.

17. A method of pelletising fine particulate material as claimed at claim 16 wherein the material is caused to be passed along a flow path and the preliminary agitation comprises causing the material to vibrate as it traverses the flow path.

18. A method of pelletising fine particulate material as claimed at claim 17 wherein the flow path comprises an inclined chute which is caused to vibrate.

19. A method of pelletising fine particulate material as claimed at claim any one of claims 15 to 18 wherein the pre-treatment effected by the screening action and/or the preliminary agitation prior to delivery onto the surface or screen serves to essentially homogenise the fine particulate material thereby facilitating the subsequent production of pellets of a relatively uniform hardness and density in an optimal manner.

20. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the pelletised material flowing from the apertures is screened to separate non-pelletised or partially-pelletised material.

21. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the material is able to be treated in its dry, raw state.

22. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the material is treated prior to delivery to the surface to increase its inherent cohesive characteristics.

23. A method of pelletising fine particulate material as claimed at claim 22 wherein the treatment comprises the application of a binding material to the particulate material.

24. A method of pelletising fine particulate material as claimed at claim 22 wherein the treatment comprises electrostatically treating the material to cause it to become electrostatically charged.

25. A method of pelletising fine particulate material as claimed at claim 22 wherein the treatment comprises heating the material.

26. A method of pelletising fine particulate material as claimed at claim 22 wherein the treatment comprises cooling the material.

27. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein the material may be subjected to a reduction action once it has been delivered onto the perforated or apertured surface in order to promote the reduction of any clumped masses of particles into smaller agglomerates which may then be more readily processed by the perforated surface or screen.

28. A method of pelletising fine particulate material as claimed at any one of the preceding claims wherein a mechanical wiper means may be operatively arranged with respect to the perforated or apertured surface such that the material delivered there onto may be broken down into smaller agglomerates for subsequent passage through the perforations or apertures.

29. A method of pelletising fine particulate material as claimed at claim 28 wherein the wiper means is also arranged to physically promote the passage of the fine particulate material through the perforations or apertures so that pelletization occurs.

30. A method of pelletising fine particulate material as claimed at claim 27 wherein one or more rolling elements are provided on top of the perforated or apertured surface to effect the reduction action.

31. A method of pelletising fine particulate material as claimed at claim 30 wherein the rolling elements take the form of hard spherical balls which, by virtue of the principal agitation of the screen, are caused to randomly move about on top of the screen and in doing so break down any clumped masses of particles into smaller agglomerates.

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: B01J 2/18, 2/20, C22B 1/14

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B01J 2/18, 2/20, C22B 1/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI + (SCREEN+ or SIEV+ OR PERFORAT+) PELLETIS+ OR BRIQUET+ AND PERFORAT+ OR APERTU+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,C,19649340 (DR. FRITSCH SONDERMASCHINEN GMBH) 28 May 1998	1-3
X	WO,A,9509616 (ASTRA AKTIEBOLAG) 13 April 1995	1-39
X	EP,B1 201052 (GEBRUEDER BUEHLER AG MASCHINENFABRIK) 17 December 1986	1-3

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 August 2002	21 AUG 2002

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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A2 456064 (THE BF GOODRICH COMPANY) 13 November 1991	1-3
X	EP,B1 393272 (MORIYAMA) 24 October 1990	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU02/00684

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
DE	19649340	NONE					
WO	9509616	AU	78262/94	BR	9407687	CN	1132477
		CZ	9600941	EG	21071	EP	721332
		FI	961431	HU	74518	IL	111081
		NO	961291	NZ	274278	PL	313766
		SG	75091	SK	392/96	US	6371171
		ZA	9407534				
EP	201052	LU	86036				
EP	456064	AU	76329/91	CA	2041978	JP	6039898
		NO	911775				
EP	393272	NONE					

END OF ANNEX